REMARKS

By this Amendment, Applicant has amended claims 1, 4, 5, 7, 9 and 13, and have added a new claims 16 and 17. Claims 1, 2 and 4-17 are pending.

Claim Rejections Under 35 U.S.C. § 103

Claims 1-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwasa in view of Shino. Based on Applicant's amendment of the claims, Applicant respectfully traverses this Section 103(a) rejection.

Claim 1 is an independent claim to which claims 2, 4, 11, 12, 15 and 16 depend either directly or indirectly. Claim 1 is directed to a display device having the following elements:

- a plurality of cathode wires,
- a plurality of anode wires arranged in a matrix shape together with the plurality of cathode wires,
- **electroluminescence elements** disposed between the plurality of cathode wires and anode wires, and **in which an electrical charge is stored**,
- a current source coupled to the anode wires,
- a voltage source coupled to the cathode wires,
- **an anode control circuit** connected between the anode wires and the current source, **for discharging the stored charge from the electroluminescence elements**, and for controlling respective current flow into the anode wires,
- **a cathode control circuit** connected between the cathode wires and the voltage source, **for discharging the stored charge from the**

electroluminescence elements, and for controlling respective voltages at the cathode wires,

- a display controller for controlling the anode control circuit and the cathode control circuit, the display controller including a setting unit for setting a discharge time for which the stored charge is discharged from the electroluminescence elements before light emission of the electroluminescence elements.

Applicant respectfully submitted that the display device of claim 1 is patentably distinguished from the Iwasa and Shino Patents at least on the basis of the requirement that the light emitting elements are electroluminescence elements and an anode control circuit and a cathode control circuit are provided for discharging the stored charge from the electroluminescence elements (hereinafter generally referred to as the "Discharging Feature" of Applicant's claimed invention). In other words, none of the references of record either teach or suggest the Discharging Feature of Applicant's claimed invention.

The anode control circuit and the cathode control circuit respectively control current flow into the anode wires and voltage at the cathode wires. And it is the anode control circuit and the cathode control circuit which discharged the stored charge from the electroluminescence elements. That is to say, the display device of Applicant's claimed invention focuses on the problem of the electroluminescence elements having a stored electrical charge which prevents electroluminescence elements from emitting light. And it is the anode control circuit and the cathode control circuit which provide for the discharging of this stored charge. None of the references of record either teach, consider, or appreciate the Discharging Feature of Applicant's invention.

The Iwasa Patent concerns in general a two-dimensional surface light emitting laser array in which laser elements are arranged in two-dimensions in an elongated region which is longer in the horizontal direction than in the vertical direction. Anode wiring extends in a direction inclined to the horizontal direction and cathode wiring extends in another direction inclined to the horizontal direction,

so that the anode wiring and the cathode wiring cross each other. The laser array has "n" laser elements arranged in the horizontal direction and "m" laser elements arranged in the vertical direction. The anodes of m laser elements arranged in the direction of the anode wiring are connected to an anode wire, while the cathodes of the m laser elements arranged in the cathode wiring are connected to a cathode wire.

According to the Iwasa Patent, even if this array is longer in the horizontal direction and a large number of laser elements are aligned in the horizontal direction, the wiring resistance and electrostatic capacitance of each wire forming an oblique matrix wiring can be small and the operational delays of the laser elements are reduced.

But the Iwasa Patent does not discuss the problem which is resolved by Applicants' claimed invention relative to discharging the stored charge in the electroluminescence elements. Thus, it is not surprising that the Iwasa Patent simply does not teach or suggest an anode control circuit and a cathode control circuit for discharging stored charge from the electroluminescence elements as defined in Applicant's claimed invention. In other words, the Iwasa Patent lacks any teaching or suggestion of the Discharging Feature of Applicant's claimed invention. This deficiency of the Iwasa Patent is not rectified by the Shino Patent.

The Shino Patent in general relates to a method of driving a plasma display panel which includes electrodes and gas between the electrodes. The plasma display of Shino has a three-dimensional matrix wiring arrangement of anodes, cathodes and address electrodes. The Shino Patent was primarily cited with respect to its Figure 6 which shows a relationship between discharge current and luminescence and a relation between discharge current and illumination efficiency for the plasma display device of Shino.

But nowhere in the Shino Patent is there any teaching or suggestion of an anode control circuit and a cathode control circuit for discharging stored charge from electroluminescence elements as required in Applicant's claim 1. Thus the Shino Patent like the Iwasa Patent lacks any teaching or suggestion of the

Discharging Feature of Applicant's claimed invention. Accordingly, the combination of these two references does not teach or suggest the display device of Applicant's claim 1, as well as the claims dependent thereon.

Independent claim 5 is directed to a method of driving a display device, with claims 6-10, 13, 14 and 17 dependent thereon.

The method of driving a display device as set forth in claim 5 includes the following steps:

- providing a display device having a plurality of cathode wires, a plurality of anode wires arranged in a matrix shape together with the plurality of cathode wires, and electroluminescence elements disposed between the plurality of cathode wires and anode wires, **and an electrical charge is stored in the electroluminescence elements**,

- **discharging the stored charge from the electroluminescence elements**,

- controlling respective current flow into the anode wires,

- controlling respective voltages at the cathode wires, and

- **setting a discharge time for which the stored charge is discharged from the electroluminescence elements before light emission of the electroluminescence elements**.

Applicant submits that the method of driving a display device of claim 1 includes the features of providing a display device with electroluminescence elements having an electrical charge stored in the electroluminescent elements, discharging the stored charge from the electroluminescent elements, and setting a discharge time for which the stored charge is discharged from the electroluminescent elements before light emission of the electroluminescent elements. It is Applicant's contention that these features are neither taught nor

suggested in the Iwasa and Shino Patents, and therefore claim 5 and the claims dependent thereon are patentably distinguished from these references of record.

The features noted above with respect to claim 5 are somewhat similar to the discharging feature of claim 1. But more importantly, Applicant notes that in the Iwasa and Shino Patents there is no teaching or suggestion of a method of driving a display device by discharging the stored charge from the electroluminescence elements and setting a discharge time from which this stored charge is discharged from the electroluminescent elements before light emission of the electroluminescent elements. By these features, Applicant has solved the problem noted above which has not been considered or appreciated by the Iwasa and Shino Patents. Lacking these features of claim 5, it is Applicant's contention that claim 5 and the claims dependent thereon are patentably distinguished from the references of record.

Based on the foregoing remarks, Applicant respectfully submits that all pending claims are patentably distinguished from the Iwasa and Shino Patents. Applicant therefore requests that the Section 103(a) rejection be withdrawn.

Newly Added Claims

By this Amendment, Applicant has added new claim 16 which is directly dependent on claim 1 and new claim 17 which is directly dependent on claim 5.

New claim 16 incorporates features which have been deleted from amended claim 1. Accordingly, claim 16 is not the addition of new matter. Moreover, it is Applicant's contention that claim 16 is distinguished from the references of record for the reasons noted above with respect to claim 1.

New claim 17 includes features which have been deleted from amended claim 5. Accordingly, claim 17 is not the addition of new matter. Moreover, it is Applicant's contention that claim 17 is distinguished from the references of record for the reasons noted above with respect to claim 5.

In view of the foregoing remarks and amendments, Applicant respectfully submits that claims 1, 2 and 4-16 are in condition for allowance. Reconsideration and allowance of all pending claims are respectfully requested.

Respectfully Submitted,

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Enclosures: Version With Markings To Show Changes Made

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January 16, 2003 Daniel N. Calder

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 16 and 17 are newly added.

1. (Amended) A display device comprising:

~~a.~~ a plurality of cathode wires,

~~b.~~ a plurality of anode wires arranged in a matrix shape together with said plurality of cathode wires,

~~c.~~ electroluminescence (EL) ~~light emitting~~ elements disposed between said plurality of cathode wires and anode wires, and in which an electrical charge is stored,

~~d.~~ a current source coupled to said anode wires,

~~e.~~ a voltage source coupled to said cathode wires,

~~f.~~ an anode control circuit ~~for connecting~~ connected between said anode wires and said current source, for discharging said stored charge from said EL elements, and for controlling respective current flow into said anode wires,

~~g.~~ a cathode control circuit ~~for connecting~~ connected between said cathode wires and said voltage source, for discharging said stored charge from said EL elements, and for controlling respective voltages at said cathode wires,

~~h.~~ a display controller for controlling said anode control circuit and said cathode control circuit, said display controller including

~~i. wherein said display controller comprises~~ a setting unit for setting ~~the~~ a discharge time for which ~~discharging~~ said stored ~~the accumulated~~ charge is discharged from ~~of~~ said EL ~~light emitting~~ elements before light emission of said EL ~~the light emitting~~ elements., ~~and operates and controls said anode control circuit and said cathode control circuit for discharging the accumulated charge of said light emitting elements within said set discharge time, and also operates and controls said anode control circuit and said cathode control circuit for emitting said light emitting elements after discharge control of said accumulated charge, and~~

~~j. wherein the luminance of said light emitting elements when emitting light in a no charge or almost no charge accumulated state to be Le, and the luminance by actual light emission to be Lp, the relationship of Le and Lp is~~

~~$Lp \geqq 0.9 \times Le$~~

~~and further the discharge time for satisfying a luminance reaching rate in the display device to be Tx, and the discharge time Rt of actual discharge is determined to satisfy the relationship of~~

~~$Tx \leqq Rt.$~~

4. (Amended) The display device of claim ~~1~~16, wherein the discharge time Rt is set to satisfy the relation of

$$Rt < B \times Tx \text{ (where } 1 < B < 10)$$

where Rt is the discharge time of actual discharge, and Tx is the discharge time

5. (Amended) A ~~driving~~ method of driving a display device, said method comprising the steps of:

providing a display device having a plurality of cathode wires, a plurality of anode wires arranged in a matrix shape together with said plurality of cathode wires, and electroluminescence (EL) elements disposed between said plurality of cathode wires and anode wires, and an electrical charge is stored in said EL elements,

discharging said stored charge from said EL elements,

controlling respective current flow into said anode wires,

controlling respective voltages at said cathode wires, and

setting a discharge time for which said stored charge is discharged from said EL elements before light emission of said EL elements~~, relating to:~~

~~a. a display device comprising a plurality of cathode wires, a plurality of~~

~~anode wires arranged in a matrix shape together with said plurality of cathode wires, and light emitting elements disposed between said plurality of cathode wires and anode wires, and~~

~~b. a driving method of said display device for discharging the accumulated charge of said light emitting elements before light emission of the light emitting elements, wherein~~

~~c. supposing the luminance of said light emitting element when emitting light in no charge or almost no charge accumulated state to be Le, and the luminance by actual light emission to be Lp, they are in the relation of~~

~~$Lp \geq 0.9 \times Le$~~

~~and further supposing the discharge time to satisfy this relation to be Tx, the discharge time Rt of actual discharge is determined to satisfy the relation of~~

~~$Tx \leqq Rt$~~.

7. (Amended) The display device of claim 1, wherein Tf is the rise time of an ~~said light emitting~~ El element accumulating the charge sufficiently, and Te is the rise time of ~~said second light emitting~~ an El element having no charge accumulated in the El ~~light emitting~~ element or almost no charge accumulated, being in the relation of

$$Tp = K \times (Tf - Te) + Te \qquad (\text{where } 0 < K < 0.5)$$

and the rise time Tp to satisfy this relation is determined, and further supposing the discharge time corresponding to said rise time Tp to be Ty, and the discharge time of actual discharge to be Rt, the discharge time Rt is set to satisfy the relation of

$$Ty \leqq Rt.$$

9. (Amended) ~~A driving~~The method of driving a display device according to claim 5, wherein~~, relating to:~~

~~a. a display device comprising a plurality of cathode wires, a plurality of anode wires arranged in a matrix shape together with said plurality of cathode wires, and light emitting elements disposed between said plurality of cathode wires~~

~~and anode wires, and~~

~~b. a driving method of said display device for discharging the accumulated charge of said light emitting elements just before light emission of the light emitting elements, wherein~~

~~c.~~ Tf is the rise time of said ~~second light emitting~~ EL elements accumulating the charge sufficiently in ~~the light emitting~~ said EL elements, and Te is the rise time of said ~~second light emitting~~ EL elements having no charge accumulated in ~~the light emitting~~ elements or almost no charge accumulated, and the rise time Tp is determined by ~~being in~~ the relation ~~of~~

$$Tp = K \times (Tf - Te) + Te \quad (\text{where } 0 < K < 0.5)$$

~~and the rise time Tp to satisfy this relation is determined,~~ and ~~further supposing~~ the discharge time corresponding to said rise time Tp ~~to be~~ is Ty, and the discharge time of actual discharge ~~to be~~ is Rt, then the discharge time Rt is set to satisfy the relation of

$$Ty \leqq Rt.$$

13. (Amended) ~~A driving~~ The method of driving a display device ~~, relating to:~~ according to claim 5, wherein with

~~a. a display device comprising a plurality of cathode wires, a plurality of anode wires arranged in a matrix shape together with said plurality of cathode wires, and light emitting elements disposed between said plurality of cathode wires and anode wires, and~~

~~b. a driving method of said display device for discharging the accumulated charge of said light emitting elements just before light emission of the light emitting elements, wherein~~

~~c. supposing~~ the maximum value of the discharge current value flowing by discharge of said accumulated charge ~~to be~~ being Ip, and the time required for the discharge current to reach the discharge current value Id to satisfy

$$Id = D \times Ip \quad (\text{where } 0 < D < 0.3)$$

~~to be~~ being Tz, and the actual discharge time ~~to be~~ being Rt, the discharge time Rt is set to satisfy the relation of

$$Tz \leqq Rt.$$